The Error-related negativity and selective attention

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Observational non invasive

Summary

ID

NL-OMON33592

Source
ToetsingOnline

Brief title
ERN & attention

Condition

- Other condition

Synonym
Not applicable

Health condition

geen

Research involving
Human

Sponsors and support

Primary sponsor: Rijksuniversiteit Groningen
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: attention, ERN, mental fatigue

Outcome measures

Primary outcome

Experimental research parameters are size of target, size of flankers, stimulus congruence, and block (measure for time on task).

The outcome variables are the reaction times, response accuracy and brain activity, reflected in selected ICA components.

Secondary outcome

Not applicable.

Study description

Background summary

When people are working on a cognitively demanding task for a prolonged period of time, they start experiencing mental or cognitive fatigue. When people become fatigued, they typically report having a lack of attention and being easily distracted. However not much of the underlying neuronal processes is known. What is known is that a certain electrophysiological effect called the ERN decreases over time. The ERN has been linked to response competition, and may signal the need for strategic adaptations in attentional processing.

The present study will investigate the link between the ERN, and selective attention. There have been studies performed into the relation between mental fatigue, which is linked to a decrease in ERN activity, and selective attention, but effects that were found could not be clearly attributed to attention. Therefore, in the present study, a suited experimental task and analysis technique will be used. The stimuli will be presented in a quadrant of the visual field, instead of centrally, which will make it possible to record

electrophysiological signals from the primary and secondary visual processing areas in the cortex. By applying independent component analyses, activation levels in these brain areas can be tracked temporally, in order to see how they are influenced by attention.

Attention can be looked at as a top down neuronal gain control mechanism, that acts on sensory processing areas in the brain. The role of this mechanism is to enhance task relevant signals, and to attenuate irrelevant signals. By manipulating the size of relevant and irrelevant stimuli, attentional effects on the specific processing of relevant and irrelevant information can be made measurable.

Study objective

The main research question is whether a larger ERN is followed by an increase in the intensity of the processing of relevant signals and a decrease in the intensity of the processing of irrelevant signals, as reflected in ICA component amplitudes.
The secondary objective of this study is whether time on task influences the processing of relevant signals, compared to irrelevant signals.

Study design

During this experiment, EEGs will be measured, while subjects are performing on an adapted version of the flanker task (Eriksen & Eriksen, 1974). In order to measure specific effects of attention on relevant and distracting information, a size manipulation will be applied. Our interest will specifically go out to electrophysiological effects that have sources in early visual processing areas. Here interaction efects between flanker size and other independent variables can be interpreted as the influence of these variables on the gain modulation of distracting sensory signals and interaction effects between target size and other independent variables can be interpreted as the influence of these variables of the gain modulation of relevant sensory signals.

In order to be able to record the attentional effects in early visual processing areas, stimuli will have to be presented in a quadrant of the visual field of the subjects. In this experiment, the targets and the flankers will be placed in a quarter circular arrangement, equidistant from a fixation cross, on which the subjects will have to keep their eyes focussed during the experiment. Measured from this fixation cross, the target will be placed at an angle of 45º, and the flankers at angles of 15º, 30º, 60º and 75º. The targets and flankers in this task consist of the letter characters O and H, where in each trial the four flankers will be identical. Stimuli can be congruent (e.g. HHHHH) or incongruent (e.g. HHOHH). In each trial, either the size of the target or that of the flankers is manipulated.

Subjects have to report the identity of the central target stimulus, by pressing a button (left button for H and right button for O). In total, they will have to perform this task for two hours.

Study burden and risks

The subjects may experience the experimental task as fatiguing, because of it's duration. For what is known, E.E.G. measurements pose no risks.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

Healthy males or females

Normal sleep patterns
Between 18 and 30 years of age
Normal or corrected to normal vision
Right handed
Signed the informed consent form

Exclusion criteria

Neurological complaints
Dyslexia
Working night shifts
Use of medication/drugs that may affect task performance or the neurophysiological results of the study

Study design

Design

Study type: Observational non invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	29-01-2009
Enrollment:	20
Type:	Actual

Ethics review

Approved WMO

Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL25761.042.08